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Transportation Analysis Report

Cruzane Mountain

Superior Ranger District, Lolo National Forest
Mineral County, Montana

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Scope of Analysis

This report documents the travel analysis prepared for the Cruzane Mountain Project (the project) which proposes vegetation management actions to decrease insect and disease risk, reduce hazardous fuels, and improve wildfire suppression safety. Road construction and maintenance would be needed to provide access for these actions.

The 1986 Lolo National Forest Plan requires roads to be kept to the minimum number and meet the minimum design standards possible while still meeting safety, user, and resource needs.¹ Logging system design, timber sale design, and transportation planning are emphasized in the Plan, and no roads are constructed without transportation analysis and environmental analysis.

Subpart A of the January 12, 2001 Road Management Rule (the Rule)² requires each unit of the National Forest System to: 1) identify the minimum road system needed for safe and efficient travel and for protection, management, and use of National Forest System lands (36 CFR 212.5(b) (1)); and 2) identify roads that are no longer needed to meet forest resource management objectives (36 CFR 212.5(b) (2)). In determining the minimum road system, the Forest Service must incorporate a science-based roads analysis at the appropriate scale. It is Forest Service policy (FSM 7710.3) that the travel analysis process (TAP) defined at FSH 7709.55, Ch. 20 serves as the “science-based roads analysis” required by 36 CFR 212.5(b)(1). The TAP analysis is science-based, considering social and environmental risks and benefits of the road system, a financial review, and contribution of the road system to land management objectives and desired conditions.

The Cruzane Mountain project area is the appropriate scale to complete the travel analysis process because the proposed actions are restricted to the project area. The analysis examines roads needed, and not needed, for the project. It also examines roads outside of the project area needed to transport commodities from the project to the nearest mill (FSM 7700, Ch. 7712.1 to 7712.3). The analysis is informed by transportation analyses previously prepared at the Forest³ and project scales.⁴

Project Area Description

The 3790 acre Cruzane Mountain project area is bounded by Interstate 90, Packer Creek, the East Fork of Packer Creek, and McManus Creek (see EA, Figure 6). Primary access to the project area is via Interstate 90 and National Forest System Road (NFSR) 288, Packer Creek. The rural communities of Saltese and Packer Meadows are located west and north of the project area. Haugen is located east of the project area. A predominate landform in the project area is Cruzane Mountain.

Approximately 88 percent of the project area is NFS lands. Several isolated parcels of private land located along the north perimeter of the project area rely on NFS road 288 for access.

¹ Lolo Forest Plan Standard No. 49 (p.II-17).

² Administration of the Forest Development Transportation System: Prohibition: Use of Motor Vehicles off Forest Service Roads (*Federal Register* Vol. 66, No. 9, pg. 3206).

³ Forest-wide transportation analyses were completed for the 1986 Lolo Forest Plan (pages II-85 to II-86, II-109, II-121, III-39 to III-40, IV-54 to IV-60, and VI-22 to VI-24), and the *Travel Analysis Report for the Lolo National Forest* (September 30, 2015).

⁴ The Debaugan Fuels Reduction Project (2009) encompasses, in part, the Cruzane Mountain project area.

The project area is allocated to riparian management (MA 13), timber management (MA 16), visual retention timber management (MA 24), and visual partial retention timber management (MA 25).⁵ An extensive road system is in place in these management areas and will be further developed for forest management.⁶ Roads in the project area are managed according to Lolo Forest Plan standards; to provide for resource protection, wildlife needs, commodity removal, and a wide range of recreation opportunities.⁷ The application of best management practices assures that water quality meets or exceeds Federal and State standards.⁸

The project is located in an area identified as Wildland Urban Interface (WUI) (*Federal Register* Vol. 66, No. 3, pg. 752). The area is “designated” in accordance with Section 602(b) and (c) of the Healthy Forests Restoration Act (P.L. 108-148, as amended by P.L. 115-334, Enacted December 20, 2018). The project area is also identified as a community wildfire protection zone.⁹ National Forest System Roads are needed in the project area to reduce hazardous fuels and provide safe access for fire suppression.

The project is not located in a component of the National Wilderness Preservation System; in an area where the removal of vegetation is restricted or prohibited by statute or by Presidential proclamation; or in an area where project activities would be inconsistent with the Lolo Forest Plan.

There are no Inventoried Roadless Areas (IRAs) within the project area. The nearest IRA is Gilt Edge – Silver Creek (#01792), located south of the project area.¹⁰ This IRA is physically separated from the project area by the St. Regis River and Interstate 90.

Previous Travel Analysis

Previous science-based analysis informing travel management in the project area includes the Lolo Forest Plan (1986), the Debaugan Fuels Reduction Project (2009), and the Travel Analysis Report for the Lolo National Forest (2015).

Lolo Forest Plan

The travel analysis for the Forest Plan was developed using an interdisciplinary, science-based approach, with public participation. Plan objectives state that *“roads will be kept to the minimum number and size needed to support resource management; most roads will be closed when projects are completed to protect resource values.”*¹¹ The Forest minimum transportation system is projected to be 3,852 miles of

⁵ 1986 Lolo Forest Plan; pages III-70 to III-77, III-120 to III-134.

⁶ 1986 Lolo Forest Plan; pages III-70, III-120, III-127.

⁷ Standards specific to roads are outlined in Standards 48-52o; pages II-17 to II-20.

⁸ National Best Management Practices for Water Quality Management on National Forest System Lands FS-990a, 2012, and Water Quality Best Management Practices for Montana Forests 2001, and Memorandum of Understanding Between U.S. Forest Service, Montana Department of State Lands, et.al. for Adopting and Implementing Best Management Practices for Forestry in Montana 1987.

⁹ Lolo National Forest Wildfire Risk Assessment, 2017.

¹⁰ Lolo Forest Plan Final Environmental Impact Statement, Appendices, p. C-289.

¹¹ 1986 Lolo Forest Plan Objectives, page II-2.

collector road, 1,883 miles of collector road open to public use, and 7,257 miles of local road.¹² Other non-inventoried roads (approximately 900 miles) have value for resource management access. Additional roads, to be constructed, are necessary for public access and land management.¹³

The Forest currently has 6368 miles of National Forest System roads.¹⁴ Twenty-five percent of the roads are managed for passenger vehicles. Sixty percent are managed for high-clearance vehicles and are open to the public. Sixteen percent are in custodial care and closed to public motorized use. Total road mileage on the Forest has been reduced since 1995 with decommissioning of approximately 1430 miles of unneeded roads.

Debaugan Fuels Reduction Project

In 2009, a travel analysis was prepared for the Debaugan Fuels Reduction Project, which overlaps a portion of the Cruzane Mountain Project. The Record of Decision (ROD) for the Debaugan project selected to Store, Reconstruct and Store, and Decommission approximately 12.5 miles of road within the Cruzane Mountain project area (see Table 1).¹⁵

Table 1 - Debaugan Record of Decision - Road Treatments within Cruzane Mountain Project Area

Debaugan Road Number	Current Road Number	Length (miles)	Treatment
3831	3831	4.0	Reconstruct - Store
37104	37104	0.2	Decommission
37109	16130	1.7	Reconstruct - Store
18687	18687	2.0	Store
37108	16129	2.0	Store
37368	37368	0.7	Decommission
37369	37369	0.5	Decommission
37370	37370	0.3	Decommission
37323	37323	1.1	Decommission

In the Debaugan ROD, the Deciding Officer explains that road storage and decommissioning not associated with reconstruction activities will be implemented when funding becomes available. In the situation where these roads are used to access fuel treatments, the timing of road closures will depend on when fuel treatments are completed. To date (2019), the most fuel reduction and road treatments that were proposed in the Cruzane Mountain project area have not been implemented. Hazardous fuels reduction and road management actions, outside of the Cruzane Mountain project area, were completed between 2009 and 2014.

¹² 1986 Lolo Forest Plan, pp. II-85 to II-86, III-39 to 40, IV-54 to 61.

¹³ 1986 Lolo Forest Plan, Table IV-20.

¹⁴ NRM Infra user view II_ROAD_CORE, May 8, 2019.

¹⁵ Debaugan Fuels Reduction Project, Environmental Impact Statement, Record of Decision, pp. 37-39.

Travel Analysis Report for the Lolo National Forest

In 2015, the Lolo National Forest conducted a Forest-wide travel analysis in compliance with the January 12, 2001 Road Management Rule.¹⁶

The *Travel Analysis Report for the Lolo National Forest* (TAR) describes the science based travel analysis process (TAP) conducted by the Forest, and its findings. Approximately 6,080 miles of National Forest System (NFS) road across the Forest were determined to be “*likely needed*” for forest management access, 113 miles of NFS road were determined to be “*likely not needed for future use*”. No NFS roads within the Cruzane Mountain project area were identified as “*likely not needed for future use*”.

The TAR explains that further site-specific project travel analyses would be used to determine the need for additional roads and identify other roads not needed. The forest-scale Travel Analysis Report helps to inform the Cruzane Mountain project-level transportation analysis. It provides useful information to help develop and prioritize proposed actions that include travel management and/or transportation system changes.

Existing Situation

The project area contains approximately 14.8 miles of National Forest System Road (NFSR), 9.3 miles of undetermined roads (UND), and 12.3 miles of County, private or other jurisdiction roads (Lolo National Forest Road Atlas (INFRA Database)) (see Table 2). Field surveys were completed in 2018 to confirm road location and condition.

Table 2 - Road System and Jurisdiction

System	Jurisdiction	INFRA Database Miles	GIS Miles
National Forest System Road	Forest Service	14.8	14.4
Undetermined	Forest Service	9.3	9.4
Interstate/State Highway	State of Montana	6.0	6.0
Private	Private	3.3	3.4
County	County	3.0	0.9
Total		36.4	34.0

Outside of the project area boundary, the haul route to the nearest mill (Idaho Forest Group in St. Regis, Montana) includes approximately 1.6 miles NFSR 288 (Forest Service maintenance – aggregate surface), .6 mile of NFSR 288 (County maintenance – aggregate surface), 1.3 miles of NFSR 288 (County maintenance – paved surface), 16.4 miles of Interstate 90 (Federal maintenance), and 1.6 miles of MT 135 (State maintenance – paved). Haul from the project is routed east on NFSR 288, toward Haugan, because of a transportation network impediment at Saltese (rating of County bridge is under gross vehicle weight of a loaded log truck).

¹⁶ Administration of the Forest Development Transportation System: Prohibition: Use of Motor Vehicles Off Forest Service Roads (*Federal Register* Vol. 66, No. 9, pg. 3206).

Road Condition

Arterial and collector roads within the project area (NFSRs 288, 3835, and 3845) are in good condition; they are suitable for the vehicle travel described by the road's assigned operational maintenance levels (ML).¹⁷ NFSR 3831 (collector) is vegetated with brush and trees and not passable to vehicles.

Except for NFSR 3831, the arterial and collector roads in the project area receive annual upkeep including brushing, blading, and drainage structure maintenance; and are open to motor vehicle travel yearlong. When free of snow, they function along with other roads and trails on the Superior Ranger District, as a motorized trail for wheeled vehicles. In winter, NFSR 288 is part of an established snowmobile trail; closed to wheeled vehicles.¹⁸

Table 3 - Functional Class and Operational Maintenance Level

Functional Class	Operational Maintenance Level ¹⁹	INFRA Database Miles	Percent
Arterial	Maintenance Level 3	3.6	24.2
Collector	Maintenance Level 3	0.3	1.9
	Maintenance Level 2	0.9	5.9
	Maintenance Level 1	3.5	23.4
Local	Maintenance Level 2	1.1	7.3
	Maintenance Level 1	5.5	37.4
	Total	14.8	

Except for the first 0.2 miles of NFS road 18687, local roads (Forest Service jurisdiction) in the project area are mostly vegetated with brush and trees, and are not passable by motorized vehicles; in many areas even passage on foot is difficult because the vegetation density. These roads receive periodic inspection and custodial care.

Deferred maintenance needs on NFSRs 288, 3835 and 3845 are generally limited to: surface blading, roadside brushing, weed spraying, and minor drainage structure maintenance. The replacement of culvert crossings on NFSR 288 and West Fork Timber Creek, McManus Creek, East Fork of Packer Creek, and an unnamed tributary to the East Fork of Packer Creek is recommended. Culvert cross-sections at these locations are smaller than bank-full width, and therefore, partially inhibit fish movement and are at-risk to debris flows and failure during high water events. The length of these culverts is also too-short relative to the road width, increasing the potential for direct sediment delivery from the road surface to local waterways. Until replacement, sediment delivery may be mitigated at these locations by road surface narrowing, inlet/outlet armoring, localized aggregate surfacing, and installation of surface drainage structures (drain dips and/or ditch sediment retention impoundments) and roadside delineators to prevent side-cast of material during maintenance.

¹⁷ Maintenance levels define the level of service provided by, and maintenance required for, a specific road. Operational maintenance levels are assigned to a road based on current needs, road condition, budget constraints, and environmental concerns (FSH 7709.58).

¹⁸ Lolo National Forest Motor Vehicle Use Map, January 2015 and Over Snow Motor Vehicle Use Map December 2014 (36 CFR 261 Part B, 36 CFR 261 Subsections 53-56).

¹⁹ Maintenance Level 1 roads are closed to motor vehicle use. Maintenance Level 2 roads are generally maintained for high clearance vehicles. Maintenance Level 3, 4, and 5 are generally maintained for use by passenger cars during allowed season of use.

Deferred road maintenance needs on NFSR 3831 (collector), and other vegetated roads in the project area include: clearing and grubbing of trees and brush, road surface blading, repair or replacement of minor culverts, installation of surface drains (drain dips or water bars), weed spraying, and seeding to return these roads to their original design standard. On NFSR 3831, there are also needs to lower the horizontal alignment of the road entrance to match the elevation of adjoining NFSR 288 (completed in 2019) and to replace the major culvert (undersized) on McManus Creek.

Past road management in the project area has been limited to periodic inspections and reoccurring maintenance including road surface blading, roadside brushing, herbicide application for weed control, and drainage structure maintenance (cleaning and armoring). NFSR 288 is maintained annually in the winter for snowmobiles (snow grooming).

Road Density and Location

Total NFS road density on NFS lands in the project area is approximately 2.5 miles/square mile. Management Areas within the project area are expected to have road densities ranging from 2.8 to 6.7 miles per square mile.²⁰ Approximately 2.4 miles of road are located within 300 feet of streams where the potential for impacts on water quality is highest.

Motorized Access

Public motorized vehicle access is available on 4.3 miles (30 percent) of NFS road in the project area (see Table 4). Open road densities are approximately 0.71 miles/square mile.

Table 4 - Access and Travel Management

Travel Code	Vehicle Type Restricted			INFRA DB Miles	Percent
	Road Vehicle	Motorcycle and ATV	Snowmobile		
A	Yearlong	Yearlong	Yearlong	9.95	70
H	Oct. 15 – Dec. 1	Oct. 15 – Dec. 1	Oct. 15 – Dec. 1	0.25	2
K	Variable	Variable	Variable	3.95	28

Vehicle use in the project area is primarily non-commercial; driving for pleasure, fishing and hunting, firewood gathering, berry picking, camping, winter sports, traveling to a local destination, and other minor uses. To avoid Interstate 90, local residents use NFSR 288 as a primary thru-route between the communities of Saltese, Packer Meadows, and Deborgia.

There are no unique access points (vista overlooks, special use areas, campgrounds, etc.) within the project area that are directly served by the transportation system. Intermittent commercial log truck traffic occurs on NFSRs 288, 3835, and 3845 from private land and NFS lands in the East Fork Packer Creek, McManus Creek, and Timber Creek drainages, north of the project area.

Road Maintenance Costs

The annual cost to maintain National Forest System Roads in the project area is estimated to be \$3971 (see Table 5); approximately 2.8 percent of the average annual forest maintenance budget.²¹

²⁰ 1986 Lolo Forest Plan; pages III-70 to III-77, III-120 to III-134. Average road densities are monitored at the Forest scale based on the collective acreage of the Management Area, rather than at the project level.

²¹ Average annual forest maintenance budget is \$140,000. Approximately \$400,000 of additional capital investment funds are available on a 3-year basis for bridge and major culvert replacement and other deferred maintenance. Average annual forest maintenance budget is \$140,000. Approximately \$400,000 of additional capital investment

Table 5 - Cruzane Mountain Project Area - Road Maintenance Costs

Operational Maintenance Level	Miles	Annual Maintenance Cost	Maintenance Interval (1 in X Years)	Annual Cost/Mile	Total Annual Cost
1 – Basic Custodial Care (Closed)	8.9	\$700	25	\$28	\$251
2 – High Clearance Vehicle	2.0	\$2000	11	\$182	\$351
3 – Suitable for Passenger Cars	3.9	\$3500	4	\$875	\$3369
Total	14.8				\$3971

In general, annual maintenance needs (roadside brushing, surface blading, minor drainage structure maintenance, weed spraying) are low because NFS roads were originally designed and constructed to be “self-maintaining” using design features such as road crowning or outsloping, ditching, and properly spaced drainage. Forest Service policy directs engineering, quality control, earthwork, road bases, incidental construction (e.g., culverts, riprap, seeding), and materials.²²

When comparing the cost to maintain arterial, collector, and local roads, annual maintenance costs for National Forest System Roads 288, 3835, and 3845 are the highest because they are open to motorized vehicle travel and are maintained for passenger cars or high clearance vehicles. Other roads in the project area are closed to vehicle travel or are closed by vegetation and in custodial care. The Montana Nightriders Snowmobile Club maintains NFS road 288 for winter snowmobile use (signing, grooming).

Road Access Rights and Needs

Easements for National Forest System Road rights-of-way through adjacent private land were previously acquired. No additional right-of-way is required for the project.²³

Issues

Road construction and maintenance can have a greater impact on forest resources than any other management activity.²⁴ Forest roads can precipitate substantial changes to landscape structure and composition (Foreman and Alexander 1998; McGarigal *et al.* 2001; Hawbaker and Radeloff 2004; Hawbaker *et al.* 2005) and symbolize a legacy of human disturbance (Forman and Alexander 1998). In mountain landscapes, terrain is a key factor influencing road networks. Road configurations, combined with local environmental conditions, result in different effects on watersheds, wildlife, vegetation, recreation and disturbance processes (Forman *et al.* 2003).

Three primary issues are associated with the positive (benefit) and negative (risk) effects of forest roads and their use including:

- access – availability of public motorized vehicle access for recreation and other forest uses;
- economics – costs (budget availability) to maintain roads; and

funds are available on a 3-year basis for bridge and major culvert replacement and other deferred maintenance activities (average of \$133,000/year). And, an additional \$150,000 are received per year for Aquatic Organism Passage (culvert resizing). In total approximately \$423,000 is available per year for road related maintenance.

²² Forest Service Pre-Construction (FSH 7709.56) and Construction Handbooks (FSH 7709.57) provide direction on location, survey, design, and construction and reconstruction of roads.

²³ FSH 2432.22b and FSM 5460.

²⁴ 1986 Lolo National Forest Plan, pg. IV-54.

- environmental impact – adverse effects of roads on various resources, including weed establishment and spread, wildlife habitat, water quality and fish, visuals, non-motorized recreation, and roadless resources.

Benefits, Problems and Risks

To assess the benefits and risks of the transportation system for the project, a quantitative rating process was used to examine the issues described above. Resources served by roads were considered **Benefitting**. Benefitting resources generally include: recreation, fire prevention and management, and forest management such as timber harvest. Resources that may be negatively impacted by roads were considered to be at **Risk**. Resources at risk generally include aquatics, wildlife, visuals, heritage, and roadless character.²⁵

The rating scale for each resource was evaluated on a scale of 0 to 10, with 0 representing very “few” or “no” benefits or risks, and 10 representing “very high” beneficial values or “severe” negative impacts (see project file for rating matrix). For **Benefits**, a road segment with a low rating is likely “not needed”. For **Risks**, a road segment with a low rating is “benign” or has very few negative impacts to the resource.

By combining resource rating scores, an average Benefit/Risk rating was assigned to each road. For example, a combined rating of “2/10” means the road has relatively low benefits and very high risks. Because quantitative ratings create a wide range of scores (*0 to 10*), the quantitative scores were summarized into three categories (**Low, Medium, and High**) and used to summarize the Benefit/Risk for each road (see project file for rating matrix). Private roads and roads of other jurisdictions were not rated.

Opportunities and Priorities

Based on scoring and the need for the road (see Necessity of Roads), one of three actions was recommended for the road including: “**Keep**” “**Store**” or “**Decommission**”. Approximately 14 miles were recommended to be kept. Approximately 0.03 miles were recommended for storage. Approximately 8 miles were recommended for decommissioning (see project file).

Table 6 - Cruzane Mountain TAP Recommendations

Recommended Road Actions	Miles
Keep – Retain for short- and long-term access.	14.06
Store – Not needed for short-term access. Retain for long-term access.	0.03
Decommission – Not needed for long-term access.	8.6

Roads identified as “keep” would remain on, or be added to, the National Forest System. These roads would be retained, for short- and long-term access and receive annual maintenance as per operational maintenance level. Roads identified as “store” would also remain on, or be added to, the National Forest System for long-term access. Following project implementation, they would be placed into an environmentally benign condition until they were needed again in the future. Storage treatments would include entrance closure, removal of culverts, and scarification and seeding of the road surface. Roads identified as “decommission” are no longer needed for access. They would remain in, or be restored, to forest production. Decommissioning treatments would include entrance closure, removal of culverts, scarification or full-recontouring of the road prism, placement of coarse woody debris, and seeding of the road surface.

²⁵ Roads Analysis, Informing Decisions about managing the National Forest Transportation System. FS-643, 1999

Necessity of Roads

The National Forest Management Act (NFMA) requires that the necessity of roads be documented and road construction be designed to “standards appropriate for the intended uses, considering safety, cost of transportation, and impacts on land and resources”.²⁶

Science-based literature indicates that road networks in forested landscapes are needed to provide access for forest management activities (Foreman et al. 2003). Road standard and location can govern efficiencies for felling, processing, extracting, and transporting forest commodities to processing facilities. Harvest systems and road networks are influenced by landform and topography (slope configuration, consistency and steepness), and other factors that control the dendritic pattern of a transportation system (Krogstad and Schiess 2007).

Because National Forest System lands within the project area are suitable for timber management, the existing transportation system was assessed to determine whether it provides adequate access for conventional (ground based tractor) and cable harvest systems. Estimated yarding distances (EYD) of 1500 feet were used to determine desired road spacing.²⁷ In addition, slope configuration (convex, concave, and slope steepness) were field measured to determine the optimal location for roads for harvest systems. Based on this analysis, it was determined that additional roads are needed to provide access for timber harvest and removal. The construction of additional roads is necessary to remove hazardous fuels, conduct vegetation management treatments, and transport timber commodities. Several existing roads are “not needed” because they are inappropriately placed on the landscape, or duplicative.

To address fire suppression access needs, high probability fire ignition points, topography, fuel condition, fire spread, safety of ingress and egress, and firefighting tactics were examined. Based on this assessment, it was determined that additional roads are needed to provide safe ingress and egress for wildland fire suppression in the area.

Science-based literature indicates that forest roads are a key factor influencing cessation of wildfires because they serve as fire breaks and provide access for fire suppression activities (Hann et al. 1997; USFS 2001). A study of several large fires found that fire boundaries tend to be near roads (Narayanaraj and Wimberly 2011). Higher road densities typically reflect higher levels of human activities (Hessburg and Agee 2003) that often create fuel discontinuities. Higher road densities provide ease of access for fire crews and equipment (Hann et al. 1997). Roads act as a physical barrier (fuel discontinuity) and therefore are important in stopping fire (Narayanaraj and Wimberly 2011; Price and Bradstock 2010).

When designing road networks for fire suppression objectives, consideration of environmental factors that influence fire behavior and suppression tactics is important. For example, topography modifies localized weather patterns creating microclimates. These microclimates affect landscape vegetation diversity, the moisture content of fuel, and fire behavior (Pyne et al. 1996; Taylor and Skinner 1998). Areas with low heat index, such as north aspects, are positively associated with fire boundaries because they are sheltered from solar radiation and receive the shortest heat periods, which result in higher fuel moisture and lower fire intensity than exposed aspects (Narayanaraj and Wimberly 2011). Fire boundaries tend to be near linear landscape features such as streams; are often associated with sheltered aspects, coves and flat areas; and tend to be located in areas with low vegetation cover and low fuel loads (Ibid). Fire boundaries are also positively associated with ridgelines. Ridges are likely to be rockier and have discontinuous fuels. Fire tends to stop at ridges because it has to switch from uphill to downhill spread, which tends to result

²⁶ 16 USC 1604; Sec.8

²⁷ Forest Engineering Incorporated, Intermountain Harvesting Workshop. 1990.

in lower fire intensity (Ibid). Fuel load, fuel size and fuel distribution critically affect all aspects of fire behavior, including the rate of fire spread and the probability that fuel combusts (Rothermel 1983). Although fire boundaries are influenced by multiple factors, roads tend to have the largest influence of any single variable (Narayanaraj and Wimberly 2011).

Interstate 90 and Cruzane Mountain are high probability locations for human and natural (lightning) fire starts. Private land ownership and residential development is located west, north, and east of the project area with Interstate 90 along the south. Typical winds in the area are generally out of the west and southwest, which align with the local topography, and tend to funnel down the St. Regis River and down Silver Creek. Rapid fire growth toward the east and northeast is expected with the combination of local winds, steep slopes, and the south (high energy) aspect toward I-90. Fire starts along the north face would likely grow upslope (mainly moving south) and to the east. Firefighting tactics would likely include direct fireline construction (initial attack) along the “heel” or base, and flanks of the fire. Firelines, for indirect or “head” attack, could be used along the Cruzane Mountain ridgeline, and/or near private land and residences in the riparian area of Packer Creek, to intercept the spread of fire, depending on fire progression. A burnout could also be conducted on the north aspect, immediately below the Cruzane Mountain ridgeline to provide a ridgeline fuel break. Ingress and egress from the north, would provide safe access to the Cruzane Mountain ridgeline. A midslope road and lower slope road (NFSR 18687), could also provide alternative locations for fire suppression on the low-energy (north) aspect, and provide access to suppress firebranding (spotting) that could occur over the Cruzane Mountain ridgeline.

Environmental Consequences

Analysis Methods

The Forest Service Infrastructure (INFRA) database and Forest Transportation Atlas were used as the primary source of road data. INFRA is the official record of road information and includes linear events such as route status, length, jurisdiction, design standard, and maintenance level. As described above the benefit /risk assessment, harvest system, and fire suppression analyses were used to inform the need for, and design of the road network. Field surveys were conducted in 2018. Surveys focused on the identification of project access and deferred maintenance needs, and the assessment of potential road impacts on resources in the project area including water quality, fish and wildlife habitat, weed spread, soil stability, cultural resources, and visual quality. A transportation plan was developed by foresters, engineers and other resource specialists as part of a timber harvest plan. Both long-term and temporary road access were identified to implement timber harvest. Preliminary road locations were flagged and mapped to determine road construction feasibility. Road jurisdictions and authorizations were reviewed to identify easement and/or permit needs.

Proposed Actions

To provide access for the project’s proposed vegetation management treatments, approximately 4.0 miles of road would be constructed for long term access. Some of the existing roads have been stabilized to preserve the road structure during the last the last entry and require heavier equipment to adequately perform work or reconstruction to reestablish the service level needed. Approximately 6.7 miles of existing system roads would be reconstructed.

Road Construction

Field reviews of these initial locations provide critical topography, specific ground conditions (geology, slope, and soils) that are considered in the road design. This information includes the alignment and grade control, width, and drainage structure placement. Roads will be designed to the minimum standard

necessary to accommodate anticipated equipment needed for haul and long-term access needs. Taking care to locate roads that fit topography using natural benches, following natural contours, and minimizing number of stream crossings. Cut and fill slopes capable of vegetation regrowth will be seeded with Lolo native seed mix. Slash filter windrows will be installed on potentially erodible fill slopes, culvert locations and near stream channels. Approximately 5 stream crossing are planned: proposed road 37104-Ext would include a live crossing on Cruzane Gulch and one intermittent crossing on an unnamed tributary; proposed P-Road1 may have 3 intermittent stream crossings.

Road Maintenance

Roads under Forest Service jurisdiction would be maintained to provide safe, efficient haul. Best managements practices (BMPs) would be used to reduce risk of soil erosion, weed spread, and adverse effects on water quality and wildlife.²⁸ Application of BMPs have shown to be effective to protect soil and water resources. The 2018 Montana Forestry Best Management Practices Monitoring Report concluded that BMP effectiveness ratings at 97.9% for all types of natural resource impacts.

In accordance with FSM 7700, roads would be maintained to their assigned design standard and maintenance level, and would not be improved to a higher standard.²⁹ Road maintenance would, in general include road surface clearing and brushing, surface blading and reshaping, and minor drainage structure repair and installation. Cut and fill slopes capable of vegetation regrowth will be seeded with Lolo native seed mix. Slash filter windrows will be installed on potentially erodible fill slopes, culvert locations and near stream channels. Dust palliatives (calcium or magnesium chloride) would be applied on portions of NFRS 288 to minimize fugitive dust, damage to road surface materials, and maintain safe driving conditions (sight distance). Water would be used, as needed, on other roads for surface protection and to control dust.

Road 37104 will have spot aggregate application near stream crossing and gate installed at approximately mile post 0.28.

All pipes on Road 3831 need replaced, except for at Cruzane Gulch. The McManus crossing will be used with a temporary bridge and then restored after operations on the south face of Cruzane Mountain are complete. Road 18687 will also have all pipes replaces and some spot aggregate applied. A gate will be installed at approximately mile post 0.32 or higher due to flat ground. Approximately 6.5 miles of road would be maintained during the project of which approximately 2.4 miles would be decommissioned following project completion.

During project implementation, road maintenance would be performed according to contractual provisions outlined in C-5.31 C-Provisions and T-Specifications.

Temporary Roads

Temporary road are authorized by contract to access specific timber sale units. These roads are not intended to be part of the forest transportation system and not necessary for long term resource management. Construction will be on new ground (not an existing prism) and to a minimal standard to provide access for harvesting equipment and log trucks, while minimizing impacts to soil and water resources. Nine temporary roads locations approximately 4.4 miles have been identified to access units in

²⁸ Lolo Forest Plan Standard 15 (p. II-12); Montana Forestry BMPs Forest Stewardship Guidelines for Water Quality 1991; National Best Management Practices for water Quality Management on National Forest System Lands, FS-990a, 2012.

²⁹ 36 CFR 212.10.

order to facilitate treatment. All of the proposed roads would be for administrative and timber sale use only, and would be closed to the public for their service life. All new temporary roads would be fully obliterated following use. Obliteration shall consist of re-contouring road prism including all cut and fill slopes to natural ground contour. Logging slash or other woody debris will also be placed and scattered on top of re-contoured corridor.

Road Storage/Decommission

Road storage will also be performed with an emphasis on maintaining drainage structures. Road closures will exceed 1 year. Road 16129, approximately 2 miles, will remain as closed system roads with an Operational Maintenance level 1.

Project activities would also include the decommissioning of approximately 5.4 miles of road not needed for National Forest System land access (see Table 8). Approximately 2.7 miles of road needed for project implementation would also be decommissioned after activities are complete.

Road Management Objectives

Road Management Objectives (RMOs) are a combination of statements that provide various information on the type and extent of functions a National Forest System road (NFSR) will serve and, the basic knowledge of road location requirements, project limits related to forest resources, and provide operation and maintenance requirements. RMOs document the intended purpose in providing access, applicable standards for roads, access management, and design, operation, and maintenance criteria. Resource activities, environmental constraints, and mitigation measures are also considered. Primary sources are Forest Plan Management Area direction and the road user. RMOs provide the corporate record of decisions that collectively establish

- Intent, purpose, and resource constraints for individual roads
- Active decisions made through appropriate processes including public involvement (NEPA)
- The line officer certifies that the RMOs are correctly documented rather than a record of a new decision and used on a day to day road management resource.
- Electronic RMO record in INFRA Roads Database, and signed copy at District.

For the Cruzane Mountain project, NFSR's with RMO's are listed in the Table 8.

Table 7 - RMO List

Road No.	Name
288	PACKER CREEK
3831	CRUZANE MOUNTAIN
3835	MEADOW MOUNTAIN
3845	TIMBER CREEK
16129	CRUZANE SPUR 1
16130	CRUZANE SPUR 2
16156	MEADOW LARK
16157	SPARROW HAWK
18687	CRUISIN
19254	LEGHORN
61416	BLUE SKY

Access Changes

No change in public motorized access into the project area at this time. Existing road closure devices (Gates, barriers) would be maintained or constructed with road management activities.

Cost Analysis

The cost analysis based in coordination with the transportation plan and projected timber harvest area planning process, is very useful in the development of action alternatives. These alternatives have a set of activities that will meet the objectives for the least cost. For the Cruzane Mountain Project, both commercial and non-commercial vegetation management are proposed on approximately 1,615 acres. Road maintenance, reconstruction, and new construction are considered including the McManus crossing on road 288. Costs may potentially be reduced by omitting road deferred treatments or changing road design criteria. Furthermore, the cost could increase if storage or decommissioning is opted on any constructed or reconstructed routes. The projected cost estimate summary is listed in below. Miles per road management activity is based on GIS calculated mileage due to temporary roads and new roads not having information available in the INFRA database.

Table 8 - Road Management Activity and Projected Road Cost Estimate

Road No	FC	Treatment	GIS Miles	Cost per Mile	Cost	Remarks
Road Maintenance						
288	Arterial		3.4	\$2,420	\$8,228	Last Maintained 2019
3835	Collector		0.3	\$12,500	\$3,750	2 pipes
3845	Collector		0.3	\$12,500	\$3,750	2 DR
16157	Local		0.5	\$9,000	\$4,500	3 DR
16130	Local		1.0	\$9,000	\$9,000	3-D
16130	N/A		0.4	\$9,000	\$3,600	3-D
37186	N/A		0.2	\$10,000	\$2,000	3-DN
37189	N/A		0.5	\$4,000	\$2,000	3-DN
37033	N/A		0.6	\$14,000	\$8,400	5-D
61417	N/A		0.1	\$9,000	\$900	
			7.3		\$46,128	
Road Reconstruction						
3831	Collector		3.1	\$8,000	\$24,800	
3831	Collector	Temporary Bridge			\$20,000	Remove existing culvert, Install and remove Temp Bridge.
16130	Local		0.7	\$9,000	\$6,300	
18687	Local		1.9	\$8,000	\$15,200	3 planned pipes
37104	N/A		0.6	\$9,000	\$5,400	
37186	N/A		0.3	\$9,000	\$2,700	
37186-A	N/A		0.1	\$9,000	\$900	1 planned pipe
			6.7		\$75,300	
Road Construction						
P-Road 1	Local	Add to System	1.4	\$60,000	\$84,000	3 planned pipes
37104-Ext	Local	Add to System	1.8	\$60,000	\$108,000	2 planned pipes

37186-A-Ext	Local	Add to System	0.7	\$60,000	\$42,000	1 planned pipe
			3.9		\$234,000	
Storage						
16129	Local	Store 3-SN	2.0	\$10,000	\$20,000	
			2.0		\$20,000	
Decommission						
3831	Collector	Level 3-DN	0.9	\$0		No treatment
37033	N/A	Level 5	0.1	\$8,000	\$800	Recontour
16130	N/A	Level 3-DN	0.4	\$0		No treatment
37088	N/A	Level 3-DN	1.4	\$0		No treatment
37323	N/A	Level 3-DN	1.1	\$0		No treatment
37323-A	N/A	Level 3-DN	0.1	\$0		No treatment
37368	N/A	Level 3-DN	0.7	\$0		No treatment
37369	N/A	Level 3-DN	0.4	\$0		No treatment
37370	N/A	Level 3-DN	0.3	\$0		No treatment
			5.4		\$800	
Temp Road						
T-1	N/A	Decom after use	0.1	\$9,000	\$900	TS
T-2	N/A	Decom after use	0.2	\$9,000	\$1,800	TS
T-3	N/A	Decom after use	0.4	\$9,000	\$3,600	TS
T-4	N/A	Decom after use	0.9	\$9,000	\$8,100	TS
T-5	N/A	Decom after use	0.7	\$9,000	\$6,300	TS
T-6	N/A	Decom after use	0.7	\$9,000	\$6,300	TS
T-7	N/A	Decom after use	0.5	\$9,000	\$4,500	TS
T-8	N/A	Decom after use	0.5	\$9,000	\$4,500	TS
T-9	N/A	Decom after use	0.4	\$9,000	\$3,600	TS
			4.4		\$39,600	
Grand Total			29.7		\$415,828	

Environmental Effects – see other resource reports.

Compliance with Forest Plan

Adverse effects of NFS roads on resources in the project area are primarily associated with water quality due the near-proximity of NFSR 288 to the West Fork of Packer Creek, McManus Creek, East Fork and main stem of Packer Creek, and stream crossings (see Benefit/Risk ratings in project file).

Low traffic volumes, low traffic speed on open arterial and collector roads, and the vegetated condition of local roads, minimizes the effects of the transportation system on wildlife. Low NFS road density in the project area does not cause or contribute to an impedance to wildlife movement. The project is not in a linkage zone; however, nearby Interstate 90 is recognized as a significant barrier to wildlife movement.

No heritage resources have been directly impacted by roads, or are in proximity to roads that could increase access for potential looting or vandalism. Location, and vegetation largely screen the existing road system from view; the project meets Visual Quality Objectives (VQOs) established by the Forest Plan. The project contains no roadless areas and is outside of Inventoried Roadless Areas. The Lolo National Forest Plan is consistent with the Rule.

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